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Remarks

Claims 1-19 are currently pending. Claims 1-8 have been amended. Claims 9-19 are new.

It is believed that no fees are due in connection with the filing of this Preliminary Amendment. However, if any fees are due, the Commissioner is hereby authorized to deduct said fees from Meyertons, Hood, Kivlin, Kowert & Goetzel Deposit Account No. 50-1505/5310-08000/EBM.

Respectfully submitted,



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Protective device for the confinement of explosive objects or objects suspected of being such.

BACKGROUND OF THE INVENTION

5 **1. Field of the Invention**

The present invention relates to a protective device for the confinement of explosive objects and/or objects suspected of being such of being explosive.

10 **2. Description of the Relevant Art**

When an abandoned object is discovered, especially in a public place, the precautionary course of action is to avoid touching it or displacing it and to evacuate people situated all around.

15 Considering Due to the risk of imminent explosion of a suspect object, an attempt is made to confine the suspect object in order to mitigate the effects of a possible explosion. In order to occur, eConsideration may be given to covering over the suspect object with a splinter-proof protective cover or hiding the object behind a splinter-proof protective screen.

20 When an explosive device explodes, ablast effects is are propagated in all directions, generating considerable forces upon the obstacles which it the blast effects encounters. Splinters are also projected in all directions. In the case of a When a splinter-proof protective cover is used, this the protected cover is lifted up by the explosion so that the splinter proof cover it prevents the upward projection of splinters, without effectively protecting a zone horizontally zone surrounding the explosive device or preventing the propagation of the blast effects.

25 Moreover, the an explosive device covered over surrounded by a cover is rendered completely invisible, and so that bomb disposal experts who have come to examine the device may have a certain apprehension as they free the device in order to examine it, which adds to their experts' stress. In the case of a screen, this Screens only protects a single side of the explosive device.

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Upon the explosion, ~~furthermore~~, there is a risk that the screen will be blasted by the explosion and topple over backward, ~~whereupon~~ ~~where~~ it no longer fulfils its protective function.

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Summary

5 Herein we describe The subject of the present invention is a protective device for the confinement of explosive objects or objects suspected of being such explosive. A protective device may which allows an effective protection against a possible explosion of the an object by preventing the propagation of splinters and of a blast effects. The present invention also relates to In some embodiments, a protective device which can may be easily used without touching a suspect object, and A protective device may which allows easy access to the suspect object for bomb disposal experts, whilst and maintaining an provide improved protection for the latter bomb
10 disposal experts.

15 Such aA protective device may for the substantially confinement of explosive objects or objects suspected explosive objects. of being such In some embodiments, a protective device may include comprises a sleeve. A sleeve may be which is open at its axial ends. and comprises A sleeve may include at least one layer of fabric. Fabrics for a sleeve may include a of the splinterproof type of fabric, the A sleeve may be being suitable for being placed positioned on a surface by one of its ends, A sleeve may be holding itself positionable substantially vertically to a surface so that to the sleeve surrounds a suspect object resting on the surface.

20 When an explosive device placed on a surface explodes, the blast effects and splinters are propagated in all directions, and especially in the horizontal and vertical principal directions. Some splinters and the blast effects are propagated upward. Some splinters and the blast effects head propagate downward, and are to be reflected by the ground. The Protection of people who might be situated close to proximate the explosive device must may be effected principally by preventing inhibiting the propagation of splinters and of the blast effects in the a horizontal direction.

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5 The In some embodiment, a sleeve is designed to be placed~~may be positioned vertically and/or surrounding~~ the object without substantially contacting ~~touching~~ it. The openended~~open-ended~~ sleeve may be forms a simple and highly resistant structure when faced with ~~in the event of~~ outwardly-directed, radial forces applied to the inner wall, ~~so that~~ and so the sleeve may ~~substantially~~ contains the splinters and the blast effects which are propagating radially ~~and/or, that is to say~~ substantially horizontally. The surrounds of the explosive object ~~are~~ may be protected by a sleeve.

10 Moreover, In some embodiments, the a sleeve having ~~may include~~ an opening on a top surface. An opening on a top surface of a sleeve may ~~when placed in position does not prevent~~ allow the upward propagation of the blast effects and of the splinters, ~~thus~~ and may allowing an evacuation of the energy of the explosion in a direction which presents no danger to people situated in a zone surrounding the explosive object. Energy from ~~The~~ blast effects and the splinters propagating downward ~~see their energy~~ may be at least partially absorbed as they blast effects ~~and splinters~~ are reflected from the ground. The ~~An~~ open-ended sleeve may provide ~~allows~~ bomb disposal experts a view of and access to the object through the top of the sleeve, whilst while ~~protecting them~~ the experts from the horizontal propagation of splinters and of the blast effects.

20 In one ~~some~~ embodiments, the a sleeve comprises ~~may include~~ at least one splinter-proof ring. A splinter-proof ring may include ~~comprising~~ several thicknesses of ~~fabric~~ of the splinter-proof type fabric. The ~~A~~ sleeve ~~can~~ comprise ~~may include~~ a plurality of concentric, splinter-proof rings to increase the protection offered by ~~this~~ the sleeve. In one embodiment, a splinter-proof ring ~~is~~ may be formed by a winding of splinter-proof fabric, ~~of the splinter proof type~~ and is provided with A splinter-proof ring ~~may include~~ at least one axial fastening and reinforcing seam. The ~~a~~ Axial fastening and reinforcing seam ~~may keep~~ allows ~~the~~ a splinter-proof ring ~~to be~~ held wound. Furthermore, the ~~f~~ Fastening and reinforcing seams locally may increases the rigidity of the splinter-proof type fabric used to improve the rigidity of the splinter-proof ring, ~~so that the~~ and ~~may facilitate holding~~ the sleeve ~~can be better held~~ in the vertical position. A splinter-proof

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ring can be provided with ~~may include~~ a plurality of axial seams for ~~to~~ increasing the resistance and/or strength of the ring, as well as its strength.

5 In one ~~some~~ embodiments, the ~~a~~ sleeve comprises ~~may include~~ a reinforcing ring comprising ~~including~~ at least one layer of material possessing ~~with~~ a rigidity sufficient to hold the sleeve ~~substantially~~ upright when it is placed in position. A plastics material, for example, ~~can~~ ~~may~~ be used, which has the advantage of being ~~and is~~ light ~~which may~~ so as to make the sleeve easier to handle.

10 In one embodiment, the ~~a~~ sleeve comprises ~~may include~~ at least one reinforcing web ~~which may substantially~~ surrounding the sleeve. A reinforcing web ~~may~~ increases the resistance of the sleeve to the internal forces directed radially outward and generated by the blast effects of an explosion.

15 ~~In an explosion, in order to~~ ~~To~~ prevent ~~a~~ raising of the ~~a~~ sleeve from raising during an explosion and from causing a gap to form between the ground and a bottom end of the sleeve, the device ~~can~~ ~~may~~, in one embodiment, comprise ~~include~~ a first sleeve and a second sleeve ~~that~~ ~~substantially~~ surrounding the first sleeve, ~~the~~ ~~A~~ second sleeve being ~~may be~~ slidable relative to the ~~a~~ first sleeve. In one embodiment, the first sleeve and the second sleeves are ~~may be~~ coupled 20 connected by ~~with~~ an expansion joint.

25 In some embodiments, In order to prevent the protective rings from being damaged by ~~from~~ flames created by an incendiary explosive device, the protective device ~~can be made to~~ comprise ~~may include~~ an inner protective layer of ~~the~~ ~~that is~~ fire-resistant type. A fire-resistant lining can be of the type comprising aluminum. For example, a fire-resistant lining can be provided in the form of a fireproofing fabric forming an inner wall of an outer casing of the sleeve.

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BRIEF DESCRIPTION OF THE DRAWINGS

5 Features and advantages of the methods and apparatus of the present invention will be more fully appreciated by reference to the following detailed description of presently preferred but nonetheless illustrative embodiments in accordance with the present invention when taken in conjunction with the accompanying drawings in which:

10 ~~The present invention and its advantages will become clearer from a study of the detailed description~~

15 ~~illustrated by the appended drawings, in which:~~

—figureFIG. 1 is a perspective view of an embodiment of a protective device according to the invention;

20 —figureFIG. 2 is a sectional view of an angular portion of thean embodiment of a protective device;

25 —figureFIG. 3 is a perspective view of an embodiment of a winding designed to form a protective ring;

—figureFIG. 4 is a diagrammatic sectional view of the embodiment of the protective device according shown to in figure FIG. 1, so as to that illustrates the phenomena which may occur with the explosion of an explosive device;

25 —figureFIG. 5 is a perspective view of a variant of the embodiment of the protective device according to shown in figure FIG. 1;

—figure FIG. 6 is a sectional view of a second variant of the embodiment of the device according to shown in figure FIG. 1;

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5 ~~figure~~FIG. 7 is a sectional view of ~~the embodiment of thea device according to shown in~~
~~figure~~FIG. 6 at the time of an explosion; and

~~figure~~FIG. 8 is a detailed view ~~from figure 7~~of the embodiment of the device shown in
FIG. 7.

10

While the invention is susceptible to various modifications and alternative forms, specific
embodiments thereof are shown by way of example in the drawings and will herein be described
in detail. It should be understood, however, that the drawings and detailed description thereto
are not intended to limit the invention to the particular form disclosed, but on the contrary, the
intention is to cover all modifications, equivalents and alternatives falling within the spirit and
scope of the present invention as defined by the appended claims.

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DETAILED DESCRIPTION OF EMBODIMENTS

5 In figure FIG. 1, depicts an embodiment of a protective device capable of for the substantially confining confinement of explosive objects or objects suspected of being such. A protective device referenced 1 in its entirety, appears in the form of may include a -multilayered sleeve 2. A sleeve 2 may include having an outer casing 3 provided with an inner wall 4 and with an outer surface 5. The sleeve 2 has may include openings 6, 7 proximate at its axial ends. Handles 8, here two in number, are fixed may be coupled on a top edge of the sleeve 2. In an embodiment, a sleeve may include two handles.

10 In some embodiments, The-a multilayered sleeve 2 comprises may include concentric layers or rings accommodated positioned in the casing 3. The sleeve 2 comprises, inter alia, may include splinter-proof rings and/or reinforcing rings. Splinter-proof rings may inhibit for preventing the propagation of splinters and of a blast effects, as well as reinforcing rings.

15 In figure 2, in which the references to the elements similar to those of figure 1 have been retained, FIG. 2 depicts a sectional view of an angular portion of the an embodiment of a sleeve 2 which allows the multilayered assembly of the sleeve 2 to be better visualized. The concentric layers are described successively from the inside of the sleeve 2 outward. The first 20 layer encountered ismay include the an inner wall 4 of the casing 3. An inner wall may be made of, which is preferably made of fireproofing fabric, or is provided with An inner wall may include an aluminum-type fireproofing liner. Next, the sleeve 2 comprises may include three protective rings 9 positioned disposed concentrically ininside the casing 3, and composed of Protective rings may be made of splinter-proof materials, for example of In an embodiment a protective ring may be made of the type of material used in bullet-proof vests. Next, the sleeve comprises may include a reinforcing ring 10, another protective ring 9, and an outer layer 11. A reinforcing ring may be made of semi-rigid plastics material, and another protective ring 9, and aAn outer layer 11 may forming the casing 3 with the inner wall 4 and may have having an outer

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surface 5. - The outer layer 11 can be provided in ~~may be made of any type of material or fabric whatsoever.~~

5 In figure ~~As depicted in FIG. 3, a protective ring 9 is~~ ~~may be~~ formed by a winding of a strip of splinter-proof fabric 12 in order to obtain a multilayered protective ring 9, ~~here comprising A~~ ~~multilayered protected ring 9 may include two layers. In some embodiments, The~~ ~~an axial fixing and a reinforcing seam 13 may keep the strip of splinter-proof fabric 12 substantially~~ ~~is held wound, with the aid of an axial fixing and A~~ ~~reinforcing seam 13 may~~ passing through the different layers of splinter-proof fabric in order to fix ~~couple~~ ~~those~~ ~~the~~ ends of the strips of splinter-proof fabric 11 which are situated ~~positioned~~ radially facing one another. A second

10 fastening and reinforcing seam 14 ~~may be positioned~~ diametrically opposed to the first seam 12, ~~is provided for A second fastening and reinforcing seam 14 may improved~~ ~~the~~ fastening and ~~the~~ reinforcement of the protective ring 9. In some embodiments, a ~~A~~ protective ring 9 can comprise ~~may include~~ any number of layers. ~~A~~ number of layers used to form a protective ring ~~may be~~ selected based at least partially on ~~according to~~ the protection ~~desired~~ ~~which is wished to be~~ obtained ~~and the number of different rings which are used. In an embodiment, Just one thick~~ protective ring ~~could be provided~~ ~~may be used~~. If the a sleeve 2 has sufficient strength to be held vertically when ~~placed~~ ~~positioned~~ on one of its axial ends, then ~~there is no need to include a~~ reinforcing ring 10 in the thickness of the sleeve 2 ~~may not be used~~.

15

20 When an explosive object or device or one suspected of being such is discovered on a surface, urgent action ~~is~~ ~~may be~~ taken to evacuate a security zone and to confine the object as quickly as possible with the aid of the sleeve 2. It ~~may be~~ desirable not to touch the object while placing the sleeve around the object. ~~, taking care, if possible, not to touch it.~~ In figure FIG. 4, ~~or the references to the elements similar to those of figure 1 have been retained, depicts a~~ the sleeve 2 has been ~~represented~~ placed on the ground and surrounding an explosive object symbolized by a circle 15. Upon the explosion of the explosive object 15, a blast effects ~~is~~ ~~may be~~ propagated in all ~~various~~ directions, generating considerable forces ~~upon~~ ~~on~~ the obstacles ~~which~~ it encounters. Splinters ~~are~~ ~~also~~ ~~may be~~ projected in all ~~various~~ directions.

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With a view to simplifying the explanations, the As depicted in FIG. 4, blast effects is are symbolized by arrows representing generated forces. For the sake of simplification, it is considered that the forces are may be split in the vertical and horizontal directions. The forces directed vertically upward are symbolized in figure FIG. 4 by an arrow F_{vh} , the forces directed vertically downward are symbolized by an arrow F_{vb} , and the forces directed horizontally are symbolized by the arrows FH . When one of the forces encounters an obstacle, it may pushes it the obstacle back until the resistance of the obstacle is greater than this force and so an opposite reactive force is then created. Each reflection of the blast effect partially absorbs the energy of the explosion. The reflected forces are symbolized by dotted arrows in FIG. 4. In the case of When an object 15 is placed on the ground, the downwardly directed forces F_{vb} are may be reflected by the ground, which offers a considerable resistance. The upwardly directed forces F_{vh} may escape freely through the top opening 6 made in the sleeve 2.

The horizontal forces FH provoked by from an explosion are may be propagated radially in a substantially symmetrical manner and strike the inner wall 4 of the sleeve 2. The sleeve 2, may be composed of fabrics and/or possibly of a semi rigid reinforcing ring. The sleeve 2 may have has a substantially oval, elliptical, or cylindrical shape, which may allows the sleeve 2 to effectively resist these radial forces. At the semi-rigid sleeve is possibly may deformed under the effect of the blast of the explosion so as to better to resist the internal forces exerted by the horizontal forces FH . The protective rings are may be designed to resist these considerable forces. The sleeve 2 contains may substantially contain the blast effects and the splinters. Consequently, the horizontal forces FH are may be reflected inward and, whilst being partially absorbed. The successive reflections of the horizontal forces FH inside the sleeve 2 may allow the energy of horizontal propagation created by the explosion to be at least partially absorbed and dissipated. The upwardly directed vertical forces, F_{vh} , as well as and/or the downwardly directed vertical forces, F_{vb} , reflected by the ground, are may able to escape freely through the top opening 6 formed on in the sleeve 2.

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In some embodiments, The a protective device for the confinement of explosive objects or objects suspected of being such explosive may can be used inside or outside buildings, and The protective device may uses the resistance of the ground or floor to dissipate a part of the energy produced by the explosion. In As depicted in FIG. figure 5, in which the references to the elements similar to those of figure 1 have been retained, a a sleeve 2 comprises may include webs 19 surrounding the sleeve 2. The wWebs 19 may allowing improve the mechanical resistance of the sleeve to be improved and may improve the ability of the sleeve in order to contain the blast effects of an explosion.

10 In figure 6, in which the references to the elements similar to those of figure 1 have been retained, some embodiments, a protective device 1 comprises may include a first sleeve 2 and a second sleeve 20, as depicted in FIG. 6.; A second sleeve may be less long shorter than the first sleeve 2. A second sleeve may substantially and surrounding a bottom end of the first sleeve 2. The second sleeve 20 can may be configured to slide axially relative to the first sleeve 2. The second sleeve 20 has a may have a composition similar to that of the first sleeve 2, and comprises, in particular, In an embodiment, a second sleeve may include protective rings (not represented in figure 6).

20 As illustrated in figure FIG. 7, in an explosion the sleeve 2 may be raised in the wake of by vertical forces acting upon on the inner wall 4 of the first sleeve 2 and/or in the wake of a due to reaction forces provoked by the from downwardly directed vertical forces. In this case, there is When an explosion at least partially raises a sleeve, there may be a risk of a blast effects being propagated propagating between a bottom edge of the first sleeve 2 and the ground. and of sSplinters also may being projected horizontally and passing through this space. In this easeWhen the first sleeve is at least partially raised, the second sleeve 20, being slid able relative to the first sleeve 2 and not having suffered the direct influence of the explosion, may remains unmoved, in contact with the ground. The second sleeve 20 may prevents the horizontal propagation of the blast effects and of projected splinters.

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As depicted in FIG. In figure 8, an expansion joint 21 may couple connects the bottom edge of the first sleeve 2 and the top edge of the second sleeve 20. The expansion joint 21 may include, ~~formed for example by, but is not limited to~~, an annular skirt or a plurality of tongues. An expansion joint 21 may include comprises a hem stitched on the outer surface 5 of the first sleeve 2 and an opposite hem stitched on an inner wall 22 of the second sleeve 20. Preferably, a length of the ~~In an embodiment, an~~ expansion joint 21 is ~~designed such that, may have a length such that~~ when the first sleeve is displaced relative to the second sleeve to the point of stretching the expansion joint 21, a covering over of the first sleeve 2 by the second sleeve 20 is maintained to prevent the formation of a gap.

The ~~s~~sleeves 2 can be obtained in may have different sizes according to the size of the explosive device which it is wished to confine to be confine. In some embodiments, it may be desirable to ~~By way of precautions, it might be possible to envisage confining~~ an explosive device by using different-sized sleeves, which ~~are~~ may be placed positioned successively in a concentric manner to form a plurality of protective barriers or to prevent inhibit a horizontal propagation of ~~the~~ blast effects and of splinters even if a central sleeve is slightly raised at the moment of the explosion.

The ~~In some~~ In some embodiments, a sleeve 2 surrounding the explosive device at the moment of its explosion may inhibit prevents a horizontal propagation of the splinters, whilst while allowing the splinters to be propagated upward or to proceed to strike the ground. The forces created by the ~~blast effects~~ and the splinters propagating vertically ~~will encounter~~ may contact either the ground, or the floor, or a the ceiling, which are generally resistant structures ~~which that~~ will be able to arrest may withstand the blast effects and the splinters without major damage. In addition, the sleeve may substantially contains and/or dissipates the horizontal blast effects, horizontally, as well as the horizontally projected splinters. The sleeve may offers increased protection in the horizontal direction in order to protect the ~~men~~ people and installations situated around the explosive device.

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Further modifications and alternative embodiments of various aspects of the invention will be apparent to those skilled in the art in view of this description. Accordingly, this description is to be construed as illustrative only and is for the purpose of teaching those skilled in the art the general manner of carrying out the invention. It is to be understood that the forms of the invention shown and described herein are to be taken as the presently preferred embodiments. Elements and materials may be substituted for those illustrated and described herein, parts and processes may be reversed, and certain features of the invention may be utilized independently, all as would be apparent to one skilled in the art after having the benefit of this description of the invention. Changes may be made in the elements described herein without departing from the spirit and scope of the invention as described in the following claims.

ABSTRACT

5 In various embodiments, explosive objects or objects suspected of being explosive may be substantially contained. A protective device, for the confinement of explosive objects or objects suspected to be such of being explosive may include, comprises a sleeve. The axial ends of the sleeve may be open, at the axial ends thereof. The sleeve may include with a layer of blasting-mat material of the blasting-mat type, splinter-proof material, and/or fire-resistant material. The sleeve may be designed to be embodied such as to be placed in a position and remain upright to substantially enclose a suspect object resting on a surface.